

(19)



Europäisches Patentamt  
European Patent Office  
Office européen des brevets



(11)

EP 0 959 306 A2

(12)

## EUROPEAN PATENT APPLICATION

(43) Date of publication:  
24.11.1999 Bulletin 1999/47

(51) Int Cl.<sup>6</sup>: F24D 13/02

(21) Application number: 99303978.3

(22) Date of filing: 21.05.1999

(84) Designated Contracting States:  
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU  
MC NL PT SE  
Designated Extension States:  
AL LT LV MK RO SI

(72) Inventor: Liddiard, Peter Thomas,  
Marlborough, Wiltshire, SN8 2EN (GB)

(74) Representative:  
Beresford, Keith Denis Lewis et al  
BERESFORD & Co.  
High Holborn  
2-5 Warwick Court  
London WC1R 5DJ (GB)

(30) Priority: 22.05.1998 GB 9811144

(71) Applicant: Multi-Sportswall Limited  
Marlborough, Wiltshire SN8 2EN (GB)

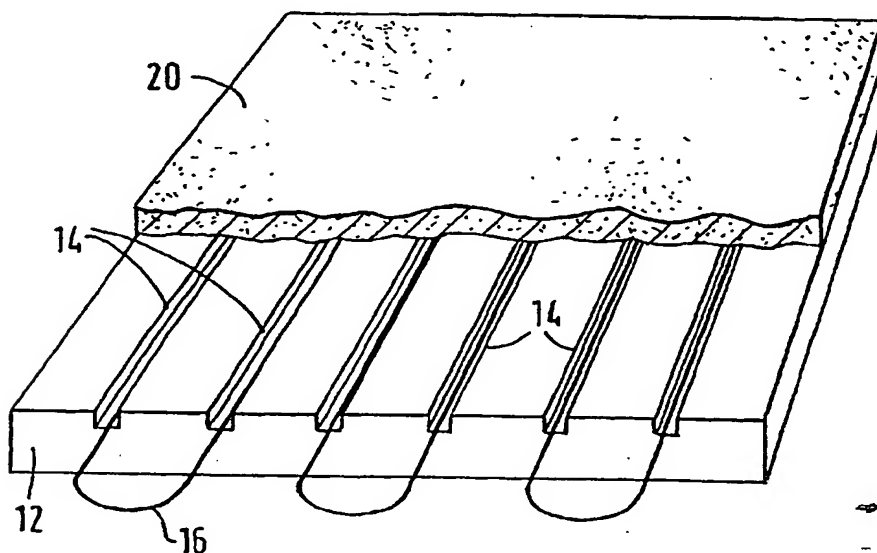
### (54) Heated floor for buildings

(57) An electrically heated floor structure for a building or a part thereof, is provided which is simple to install, does not require any wet trades to be involved in the installation, and is ready for immediate use. The floor structure comprises:

(a) panels or slabs 12 of Rockwool or other mineral

fibres having cable-receiving grooves 14 formed in a pattern in their intended upper faces;  
(b) one or more electrical heating cables 16 running through the grooves, and  
(c) an over-layer 20 of heat-retentive inert material, for example cement particle board, which provides a smooth support surface.

FIG.3



## Description

[0001] The present invention relates to a heated floor for a building, or a room in a building, to materials for use in laying the floor and to a method of laying a floor using the materials as aforesaid.

[0002] A water-heated floor structure is known in which water pipes run through grooves cut in the top face of a layer of plastics foam material, the foam being covered with a thermally conductive upper layer which conceals the pipes and grooves (see DE-A-4433119 and EP-A-0025959). The foam provides a support for the pipes which can accommodate thermal movement of the pipes and differential expansion of the pipes and surrounding material.

[0003] Electrically heated flooring is known in which heating cables are buried in cement or concrete. However, the cement or concrete is labour-intensive and messy to install and takes time to set and dry out.

[0004] A problem with which the invention is concerned is to provide an electrically heated floor structure for a building or a part thereof, which is simple to install, does not require any wet trades to be involved in the installation, and is ready for immediate use.

[0005] The problem is solved by providing a floor structure comprising:

- (a) panels or slabs of mineral fibres having cable-receiving grooves formed in a pattern in their intended upper faces;
- (b) one or more electrical heating cables running through the grooves, and
- (c) an over-layer of heat-retentive inert material which provides a smooth support surface.

[0006] The invention also provides a kit of parts for making a floor as aforesaid, said kit comprising plurality of slabs of mineral fibre for forming a base layer, said slabs having their intended upper surface formed with grooves disposed in a pattern,

a heating cable for fitting in the grooves, and at least one sheet of upper layer material for laying on the base layer to cover the heating cable and the grooves.

[0007] The invention also provides a method for forming an electrically heated floor which comprises laying on a floor base the materials defined above.

[0008] For use in the above method, the invention also provides a mineral fibre slab or panel having a pattern of grooves in one face thereof for receiving an electrical heating cable.

[0009] How the invention may be put into effect will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a diagrammatic plan of a room in a domestic house or other building having a floor provided with a single underfloor heating cable;

Figure 2 is a view similar to Figure 1, but showing two heating cables for different zones of the room; and

Figure 3 is a perspective view of a region of the floor with the upper layer partly cut away.

[0010] In Figure 1, there is shown a room 10 having a sub-floor which may be of concrete, cement, timber or steel joisting with wooden boards or chipboard, or may be a beam and block floor. The sub-floor is covered in a pattern with slabs or panels of Rockwool or other mineral fibre material. Rockwool is strong, non-flammable and has low sound transmission and it may be provided as square or rectangular slabs which can be provided with or formed by cutting with a pattern of grooves 14. A suitable slab 12 is shown in Figure 3. It is suitably of depth 30mm, thermal conductivity of 0.036 and is formed on an intended upper face with a pattern of parallel grooves 14 of width and depth 7mm which can easily be cut e.g. by means of a beam saw. If there is a need to interconnect adjacent grooves of the slab, the necessary cross-channels between adjacent grooves can easily be cut on site. Alternatively, cross-channels may be preformed in the slab surface.

[0011] A twin conductor screened heating cable 16 may be laid into or threaded through some or all of the grooves 14. In areas where low heat output is required the cable may be laid in alternate grooves in the parallel array, or in every third or fourth groove etc. Where maximum heat output is required, the cable may be laid into each groove in the array. The grooves are preferably 50mm apart, allowing a maximum length of 20m of heating cable per square metre of floor area, but grooves may be spaced more closely if higher power output per square metre is required. The heating cable may suitably have a thermal output of about 17 W/linear metre and may be arranged to provide 100-150 W/m<sup>2</sup> of power by spacing the cable runs to ensure that each square metre of floor has from about 6 to about 9 metres of heating cable. The intention is that the cable should be able to heat the floor to temperatures in the range 17-25°C, but should not permit the floor temperature to rise above 43°C. The cable is fed with power from a connector 18 and its operation may be controlled by a thermostat (not shown). The thermostat may be mounted to a wall of a room heated by the underfloor heating installation. The thermostat may have a first sensor responsive to room temperature and a second sensor located in a core in the slab 12 between adjacent turns of the cable 16. With this arrangement, the thermostat can turn power to the cable off (a) if the air temperature in the room has risen to a preset value, and in the event that expected heat dissipation from the floor into the air of the room is impeded if the temperature underneath a covering layer 20 rises above a safety value e.g. 43°C.

[0012] After the cable 16 is installed, the floor is com-

pleted by the covering layer 20. In the embodiment shown, the covering layer 20 is of smooth cement particle board of thickness about 16mm, compressive strength 15 N mm<sup>2</sup> and density 1250 kg m<sup>3</sup>. In addition to providing a load carrying surface layer, the cement particle board is resistant to rot and to impact damage, of high heat capacity and provides a heat storage function. The covering layer 20 may be of any other suitable material such as stone or concrete slabs, or metal sheet.

[0013] Over the layer 20 there may be provided an over-layer of any conventional type, for example carpet, tiles or wood.

[0014] In the arrangement shown in Figure 1 there is a single heating cable 16 which passes sinuously through the grooves. For larger spaces, the room 10 may be divided into separate zones having individual heating cables 16a, 16b provided with power from respective outlets 18a, 18b as shown in Figure 2. Each heating cable 16a, 16b may have its own thermostat controller, and separate power supply.

[0015] When a floor is to be laid, the customer may inform his builder's merchant or other distribution outlet of the number of rooms where floors are to be laid and the sizes of them. The retailer will then provide a kit comprising the appropriate number of base layer slabs or panels, the heating cable, panels to form the upper layer and any required additional equipment e.g. a thermostat. Alternatively kits may be provided in standard room sizes e.g. for fitting into a conservatory or other house extension. The heated floor may be installed very rapidly without cement or other wet trades becoming involved, and is ready for testing and fitting of tiles, a carpet or other decorative surface and for walking on almost immediately thereafter.

## Claims

1. An electrically heated floor for a building, said floor comprising a base layer having an upper surface formed with grooves disposed in a pattern, a heating cable extending in at least a portion of the grooves of the pattern, and an upper layer on the base layer which covers the heating cable and grooves, wherein the base layer is of mineral fibres.
2. The floor of claim 1, wherein the base layer comprises at least one slab of rock-wool.
3. The floor of claim 1 or 2, wherein the slab is about 30mm deep.
4. The floor of any preceding claim, wherein the grooves are generally parallel to one another at a spacing of about 50mm.
5. The floor of any preceding claim wherein cross-channels are formed in the base layer to intercon-

nect adjacent grooves.

6. The floor of any preceding claim, wherein the grooves are about 7mm in width and 7mm in depth.
7. The floor of any preceding claim, wherein the cable is a twin conductor screened cable.
8. The floor of any preceding claim, wherein the cable has a power output of 10-20 W/linear metre.
9. The floor of claim 7, wherein the cable has a power output of about 17 W/linear metre.
10. The floor of any preceding claim, wherein the cable is disposed so as to provide a power density of 100-150 W/m<sup>2</sup>.
11. The floor of any preceding claim, wherein the upper layer is of cement bonded particle board.
12. The floor of claim 10, wherein the particle board is of thickness 12-16mm.
13. A kit of parts for an electrically heated floor for a building, said kit comprising:
  - a plurality of slabs of mineral fibre for forming a base layer, said slabs having their upper surface formed with grooves disposed in a pattern, a heating cable for fitting in the grooves, and at least one sheet of upper layer material for laying on the base layer to cover the heating cable and the grooves.
14. The kit of claim 13, wherein the base layer slabs are of rock-wool.
15. The floor of claim 13 or 14, wherein the slabs are about 30 mm deep.
16. The kit of any of claims 13-15, wherein the grooves are generally parallel to one another at a spacing of about 50 mm.
17. The kit of any of claims 13-16, wherein the grooves are about 7 mm in width and 7 mm in depth.
18. The kit of any of claims 13-17, wherein the cable is a twin conductor screened cable.
19. The kit of any of claims 13-18, wherein the cable has a power output of 10-20 W/linear metre.
20. The kit of claim 19, wherein the cable has a power output of about 17 W/linear metre.
21. The kit of any of claims 13-20, wherein the upper

layer is of cement bonded particle board.

22. The kit of claim 21, wherein the particle board is of thickness 12-16 mm.

5

23. A method of forming an electrically heated floor which comprises laying on a floor base the materials defined in any of claims 13-22.

24. The method of claim 23, wherein the floor is laid on a concrete or cement base.

10

25. The method of claim 23, wherein the floor is laid on a base supported by joists of timber or steel.

15

26. An electrically heated floor for a building, said floor comprising a base layer having an upper surface formed with grooves disposed in a pattern, a heating cable in the grooves, and an upper layer on the base layer which covers the heating cable and the grooves, wherein the upper layer is of a cement bonded particle board or other cement based wood derived board.

20

27. The floor of claim 26, wherein the particle board is of thickness 12-16 mm.

25

28. A mineral fibre slab or panel having a pattern of grooves in one face thereof for receiving an electrical heating cable.

30

35

40

45

50

55

FIG. 1

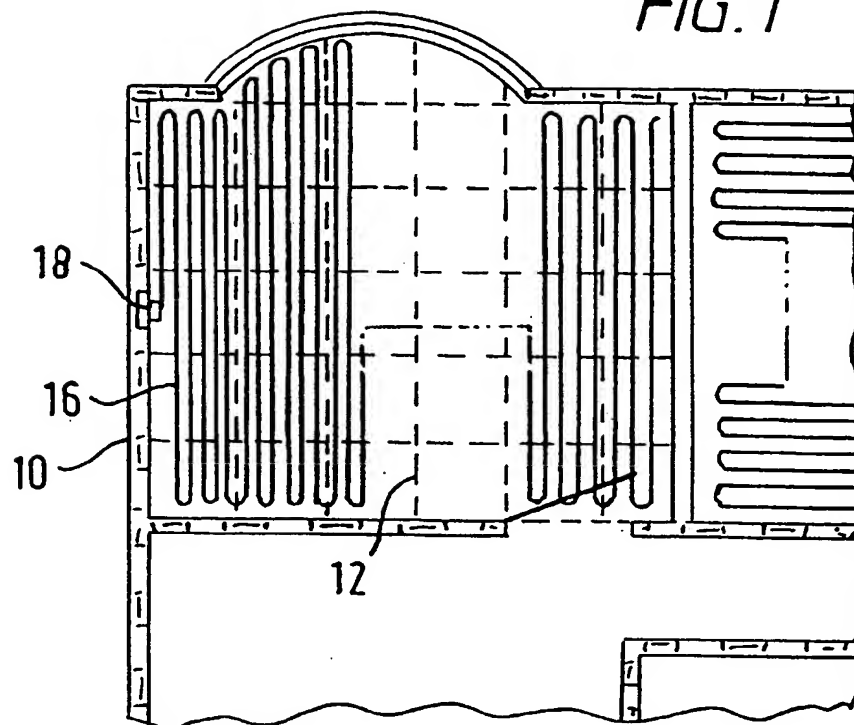


FIG. 2

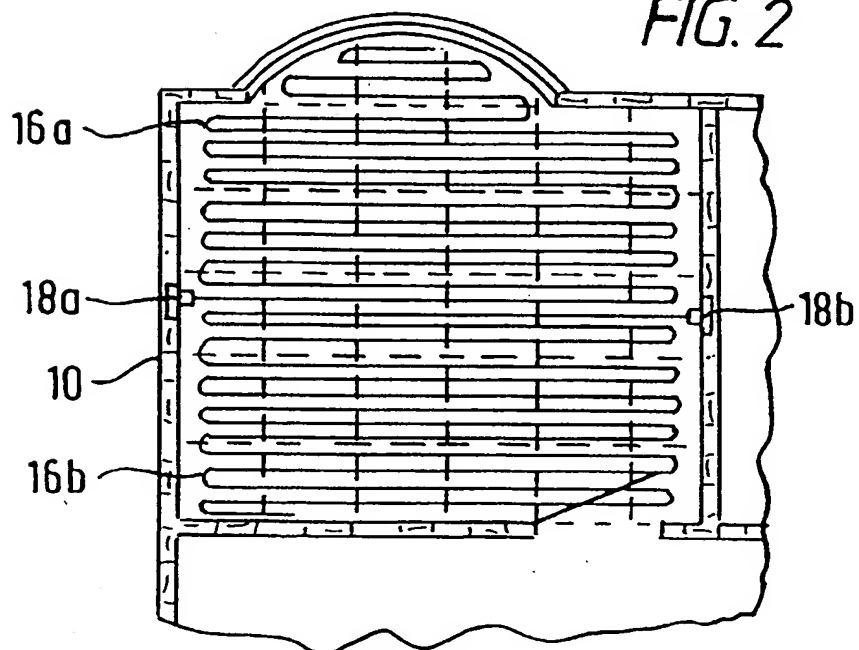
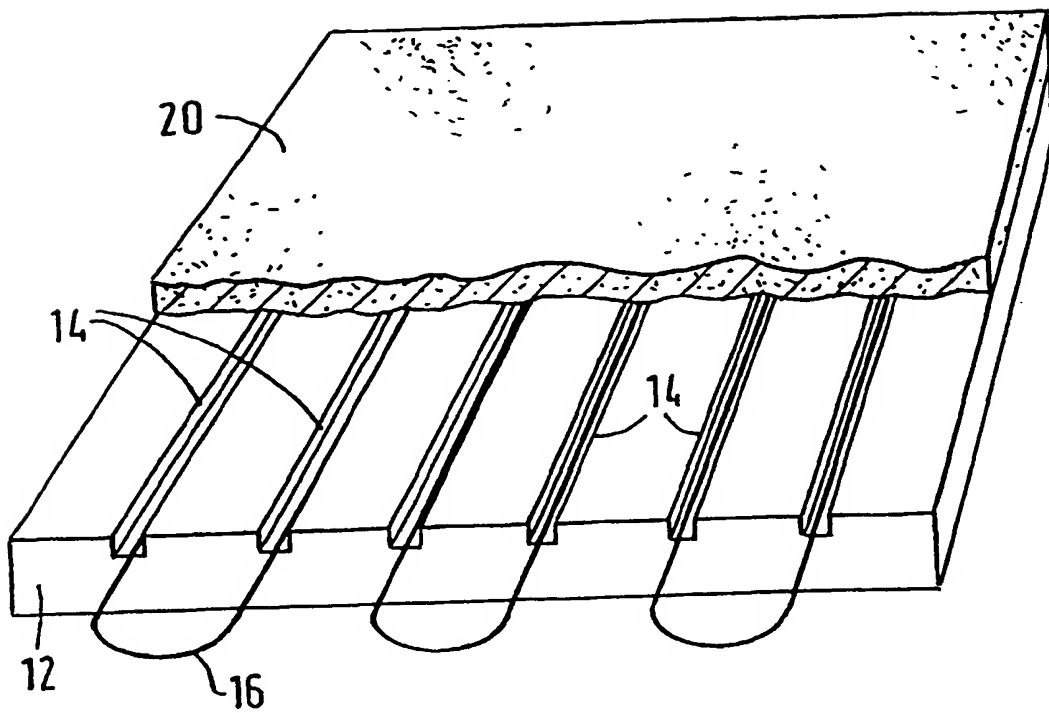
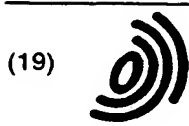


FIG. 3





Europäisches Patentamt  
European Patent Office  
Office européen des brevets



(11) **EP 0 959 306 A3**

(12) **EUROPEAN PATENT APPLICATION**

(88) Date of publication A3:  
27.09.2000 Bulletin 2000/39

(51) Int Cl.7: **F24D 13/02**

(43) Date of publication A2:  
24.11.1999 Bulletin 1999/47

(21) Application number: **99303978.3**

(22) Date of filing: **21.05.1999**

(84) Designated Contracting States:  
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU  
MC NL PT SE**  
Designated Extension States:  
**AL LT LV MK RO SI**

(72) Inventor: **Liddiard, Peter Thomas,  
Marlborough, Wiltshire, SN8 2EN (GB)**

(74) Representative:  
**Beresford, Keith Denis Lewis et al  
BERESFORD & Co.  
High Holborn  
2-5 Warwick Court  
London WC1R 5DJ (GB)**

(30) Priority: **22.05.1998 GB 9811144**

(71) Applicant: **Multi- Sportswall Limited  
Marlborough, Wiltshire SN8 2EN (GB)**

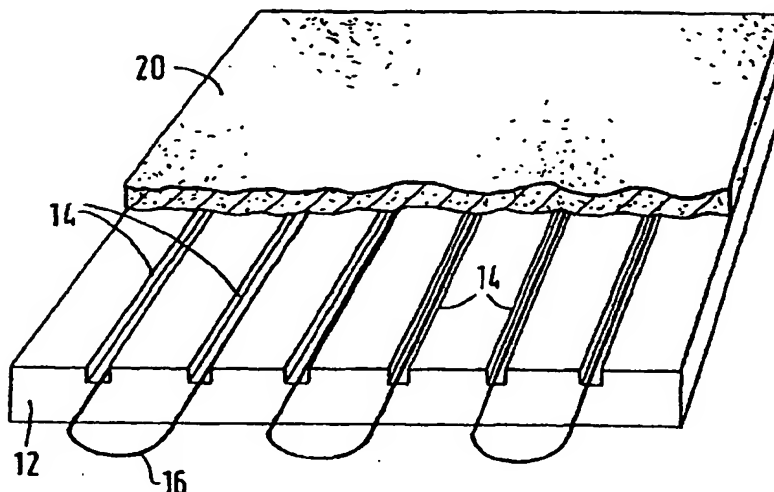
(54) **Heated floor for buildings**

(57) An electrically heated floor structure for a building or a part thereof, is provided which is simple to install, does not require any wet trades to be involved in the installation, and is ready for immediate use. The floor structure comprises:

(a) panels or slabs 12 of Rockwool or other mineral

fibres having cable-receiving grooves 14 formed in a pattern in their intended upper faces;  
(b) one or more electrical heating cables 16 running through the grooves, and  
(c) an over-layer 20 of heat-retentive inert material, for example cement particle board, which provides a smooth support surface.

**FIG.3**



**EP 0 959 306 A3**



European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number  
EP 99 30 3978

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
Y	FR 2 698 432 A (DELFAGE SA) 27 May 1994 (1994-05-27) * the whole document *	1,2,13, 14,23	F24D13/02
Y	--- PATENT ABSTRACTS OF JAPAN vol. 015, no. 151 (M-1103), 16 April 1991 (1991-04-16) & JP 03 025227 A (TAKEHITO KATO), 4 February 1991 (1991-02-04) * abstract *	1,2,13, 14,23	
A	--- WO 95 25249 A (ALSBERG TERRY WAYNE) 21 September 1995 (1995-09-21) * claims 1,12 *	5	
A	--- US 4 878 332 A (DRAKE LAWRENCE V) 7 November 1989 (1989-11-07) * the whole document *	1	
A	--- CH 617 999 A (PROTHERM AG) 30 June 1980 (1980-06-30) * claims 1,21 *	1	
A,P	--- WO 98 26222 A (FUJAS STEFAN) 18 June 1998 (1998-06-18) * page 7, line 5 - line 8; figure 3 *	1	
A	& HU 1 068 U (FUJAS) 28 May 1997 (1997-05-28)		
X,P	--- PATENT ABSTRACTS OF JAPAN vol. 1999, no. 08, 30 June 1999 (1999-06-30) & JP 11 063533 A (DAIKEN TRADE & IND CO LTD), 5 March 1999 (1999-03-05) * abstract *	1,28	
-/-			
The present search report has been drawn up for all claims			
Place of search <b>THE HAGUE</b>		Date of completion of the search <b>3 August 2000</b>	Examiner <b>Coli, E</b>
<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03.02 (P04C01)





European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number  
EP 99 30 3978

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X, P	DATABASE WPI Section PQ, Week 199920 Derwent Publications Ltd., London, GB; Class Q74, AN 1999-235213 XP002144256 & JP 11 063534 A (MATSUSHITA ELECTRIC WORKS LTD), 5 March 1999 (1999-03-05) * abstract *	1,2	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 3 August 2000	Examiner Coli, E
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P4/C01)

# ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

EP 99 30 3978

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

03-08-2000

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 2698432 A	27-05-1994	NONE	
JP 03025227 A	04-02-1991	NONE	
WO 9525249 A	21-09-1995	AU 685256 B	15-01-1998
		AU 2103795 A	03-10-1995
		AU 701134 B	21-01-1999
		AU 6191298 A	25-06-1998
		CA 2185548 A	21-09-1995
		CN 1146800 A	02-04-1997
		EP 0746727 A	11-12-1996
		FI 963652 A	14-11-1996
		JP 9511323 T	11-11-1997
		NO 963879 A	14-11-1996
US 4878332 A	07-11-1989	AU 619051 B	16-01-1992
		AU 4290289 A	04-07-1991
		CA 1307558 A	15-09-1992
CH 617999 A	30-06-1980	NONE	
WO 9826222 A	18-06-1998	HU 1068 U	28-05-1997
		AU 4962597 A	03-07-1998
		DE 19781409 D	02-09-1999
JP 11063533 A	05-03-1999	NONE	
JP 11063534 A	05-03-1999	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82